RADAR SYSTEMS SECTION
DRTE

Logafier 1025-A

RADAR SYSTEMS SECTION
DRTE

KAY ELECTRIC CO.

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OPERATION & MAINTENANCE MANUAL
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CATALOG #1025-A

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SECTION I
GENERAL INFORMATION

1.1 INTRODUCTION.

The Logafier 1025-A is a wide band logarithmic amplifier providing three logarithmic ranges and one linear range, in the 200 kc to 220 mc frequency band. Logarithmic ranges are 80 db, referenced to a 0.5 - volt rms input; 60 db, referenced to a 0.158 - volt rms input; and 40 db, referenced to a 0.05 - volt rms input. The reference voltage is the level required, at the peak of the input signal, to set it at the starting point of the logarithmic action (0 db on the logarithmic meter scale). If the peak input level falls below reference, only part of the full range is available.

The 1025-A is also a true r-f amplifier providing 57 db of gain (up to 0.3 volts rms output into a 50 ohm load) in its linear function. All ranges may be monitored by an oscilloscope for low or high speed sweep or by a built-in panel meter for c-w or slow sweep input. The output signal can be either detected or undetected r-f in any range.

Logarithmic amplification provides "magnification" of the low-level portions of a response curve. When a sweep signal is applied to a device, a graphic logarithmic display with low-level response clearly presented, can be shown on an oscilloscope. These displays are useful for checking the response characteristics of sharp bandpass filters, single-sideband filters, and other tuned circuits. Where both the tops and the skirts of the selectivity curve are significant, a threshold control adjusts the starting point of the logarithmic amplification. This allows expanded viewing of both extremes.

1.2 INSTALLATION.

Unpacking: If, upon unpacking the 1025-A, there is damage evident; please advise the carrier and the Kay Electric Company, or its local representative, as soon as possible.

Operating Notes: The 1025-A is designed for use in an environment reasonably constant in temperature and humidity. The ventilation grating will provide adequate air circulation for bench-top operation if it is left unobstructed. In any test operation using the 1025-A, impedance matching networks should be used where input and output impedances of the apparatus differ substantially. Also, the exclusive use of shielded or coaxial cables and connectors will eliminate any stray pick-up. These few precautions will maintain optimum performance and stability from the Logafier 1025-A.

1.3 SPECIFICATIONS.

Frequency Range: 200 kc to 220 mc.

Flatness: 500 kc to 100 mc ± 0.5 db.
200 kc to 220 mc ± 1 db.

Logarithmic Accuracy: ± 2 db.

Dynamic Range: 80 db, with 0.5V rms input;
60 db, with 0.158V rms input;
40 db, with 0.05V rms input.
Linear, gain variable over 57 db.

Expand Control: Variable range of 0 to 10 db on all logarithmic ranges.

Input Impedance: 50 ohms, nominal.

Vertical Output Impedance: 5 K approx.

Power Supply: Built-in supply for 110V at 50 watts (±10%), 50 to 60 cps operation. (Adaptable to 220V on request). The supply is electronically regulated.

Mounting: Bench-top or standard rack.

Dimensions: 5½" x 12½" x 19½"

Weight: 23 lb.

SECTION II
PANEL CONTROLS AND CONNECTORS

2.1 PANEL CONTROLS.

CONTROL	POSITION	FUNCTION
POWER Switch (S-1)	ON	Power is applied to T-1 and the adjacent pilot lamp is on.
	OFF	Power is removed from T-1.
RANGE Switch (S-2)	LIN	The 1025-A operates as a linear amplifier.
	40	The input signal is amplified logarithmically on the zero to 40 db down range.
	60	The input signal is amplified logarithmically on the zero to 60 db down range.
	80	The input signal is amplified logarithmically on the zero to 80 db down range.
LIN GAIN (R-122)	Variable	The linear gain of the 1025-A may be varied over a 57 db range, when the RANGE switch is in the LIN position.
EXPAND Switch (S-3)	ON OFF	The EXPAND switch makes the EXPAND THRESHOLD control operable.
EXPAND THRESHOLD (R-114)	Variable	The EXPAND THRESHOLD control determines the point at which expansion begins. Its range is from the upper 0 db to upper 10 db points of the response curve.
ZERO (R-97)	Variable	This screwdriver control is used to set the meter for proper tracking. This is used only for alignment.
SENS (R-92)	Variable	This screwdriver control is used to set the meter sensitivity. This is used only for alignment.
INT - RF OUT Switch (S-4)	INT	Provides a 50-ohm termination for the amplifier when the VERT jack is the only output being used. There is no signal present at RF OUT jack.
	RF OUT	An r-f output signal is impressed across the RF OUT jack. This is a 50-ohm output and should be terminated in 50 ohms, when used.

2.2 CONNECTORS.

CONNECTOR	FUNCTION
RF IN (J-1)	The signal to be examined is inserted at this jack.
RF OUT (J-4)	The undetected r-f output of the 1025-A is available when the INT-RF OUT switch is in the RF OUT position. The output impedance is 50 ohms.
VERT (J-5)	A detected output of the amplified response curve of the input signal is available at this jack.

SECTION III
CHECK-OUT PROCEDURE

This procedure provides an operational check of the 1025-A which can be used for incoming inspection, periodic maintenance checks, or when improper operation is suspected.

3.1 EQUIPMENT REQUIRED.

Oscilloscope, DC - 300 kc.

Sweep Generator, Kay Electric Multi-Sweep 159-B or equivalent.

50-ohm Attenuator, Kay Electric Model 30-0, or equivalent.

50-ohm Detector (wideband to 300 mc).

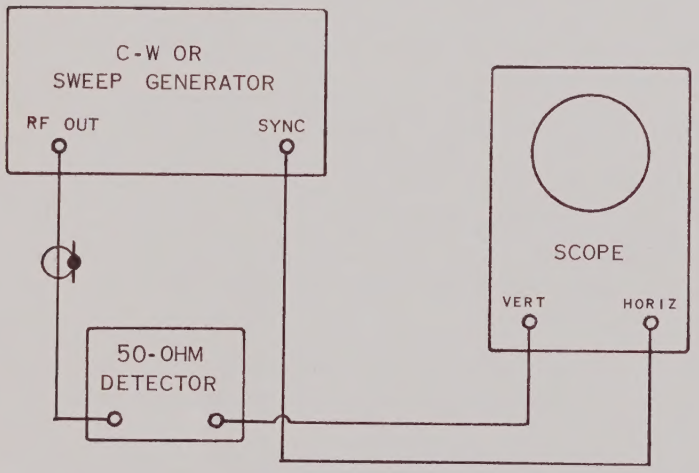


FIG. 3.1 - REFERENCE LEVEL CHECK

3.2 AMPLIFIER CHECK.

1. Connect equipment as in Fig. 3.1. Set signal generator for 0.3 volt r-f output.

2. Adjust scope gain control for 0.1 v/cm. Note level of detected output on scope screen. This establishes the reference level of 0.3 volts rms, as long as the scope gain is not changed.

3. Now connect the equipment as shown in Fig. 3.2 and attenuate the sweep generator output 57 db. Set the RANGE switch of the 1025-A to LIN.

4. See that the output level is at least 0.3 volt rms (at full linear gain).

5. Check flatness at gain of 57 db. The flatness should stay within the following limits:

± 1 db 200 kc to 220 mc
± 0.5 db 500 kc to 110 mc

3.3 LOGARITHMIC RANGES.

1. Interconnect equipment as shown in Fig. 3.3. Set signal generator for 30 mc c-w operation, 0.5 volt rms output.

2. Set RF OUT-INT switch to INT.

3. Set RANGE switch to 80 db and see that meter reads zero db.

4. Attenuate the 1025-A input 5 db and see that the meter tracks properly.

5. Check meter tracking of the 80 db range in 5 db steps. The meter should track within ±2 db.

6. Set signal generator for 0.158 volt rms output (10 db down from 0.5 volt level), and set the 1025-A RANGE switch to 60 db.

7. See that the panel meter reads zero db.

8. Attenuate the input 5 db and see that the meter tracks properly.

9. Check meter tracking of 60 db range in 5 db steps down to 60 db. Meter should track within ± 2 db.

10. Set the generator for 0.05 volt rms, output (20 db down from 0.5 volt rms level), and set RANGE switch to 40 db.

11. See that the panel meter reads 0 db.

12. Attenuate input 5 db and see that the meter tracks properly.

13. Check meter tracking of 40 db range in 5 db steps down to 40 db. Meter should track within ± 2 db.

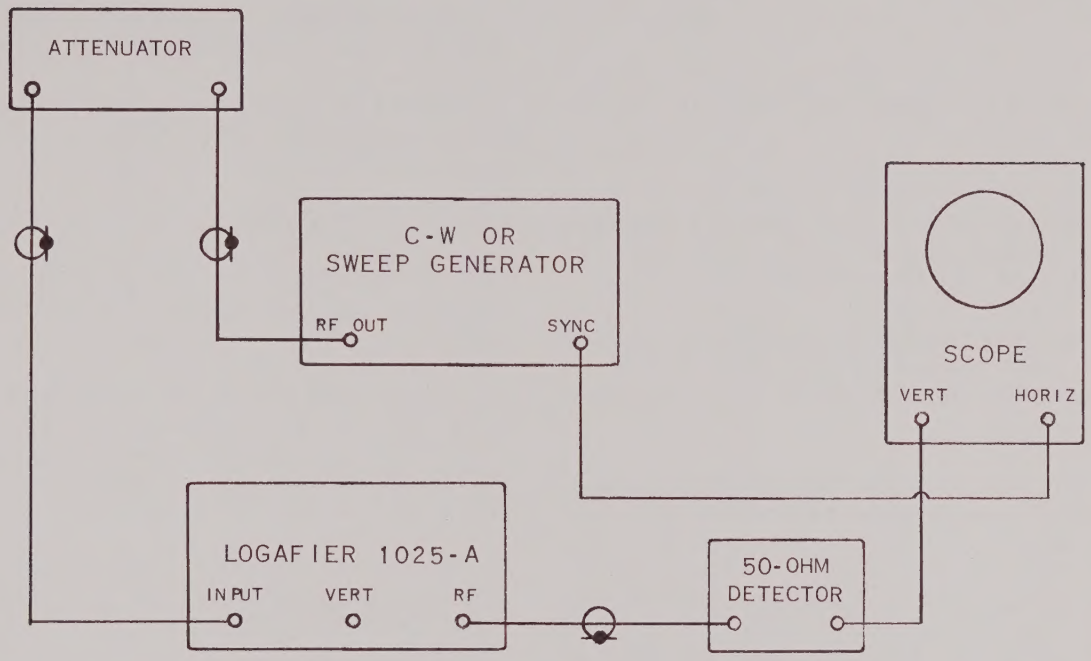


FIG. 3.2 - AMPLIFIER GAIN CHECK

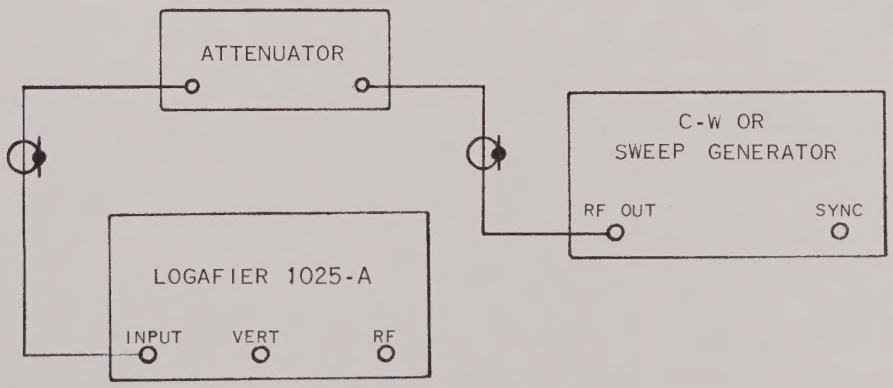


FIG. 3.3- LOGARITHMIC RANGE CHECK

SECTION IV
OPERATING PROCEDURE

4.1 INITIAL SETUP.

1. Connect the Logafier 1025-A to the AC line and allow 10 minutes warm-up time.

2. Interconnect 1025-A, signal generator, oscilloscope, and attenuator as shown in Fig. 4.1.

3. Set RANGE switch to LIN and RF OUT-INT switch to INT, set signal generator to a frequency within the pass band of the 1025-A (200 kc to 220 mc).

4. Set the signal input at approximately 0.05 volt rms and adjust the LIN GAIN control for a full scale meter reading (0 db).

5. Set the oscilloscope to approximately 0.2 v/cm sensitivity to display the output signal. The vertical deflection, established in this way, provides a useful reference since it indicates the operating range of the unit. This can be used as a guide for avoiding overload and the distortion that will result. This level corresponds to a 0 db meter reading, and is the limit for both LIN and LOG amplifiers.

4.2 LINEAR AMPLIFICATION.

Detected Output

1. Interconnect equipment as shown in Fig. 4.2 and set RANGE switch to LIN.

2. Set RF OUT-INT switch to INT (switch may be set to RF OUT if the RF OUTPUT jack is terminated in 50 ohms).

3. If a c-w signal is applied (0.5 volt rms or less), variation in signal level may be observed on the meter. Meter level can be controlled by the LIN GAIN control.

4. If a swept signal is to be used, see that its level does not exceed the limits of the normal operating range (4.1). If the signal overloads the unit, the response will be distorted.

5. With a sweep generator source, the linear response curve of the circuit under test may be observed on the scope.

6. By switching in different levels of attenuation, you can calibrate the oscilloscope screen in db.

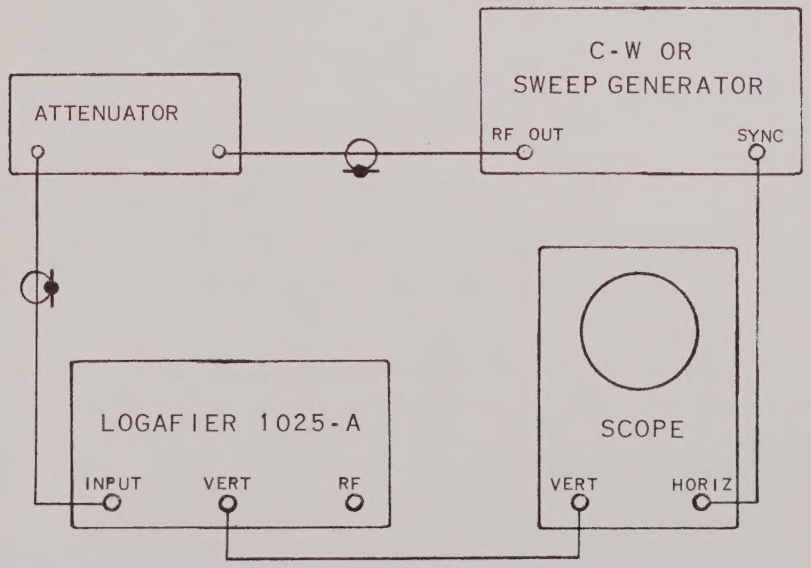


FIG. 4.1 - INITIAL SETUP

7. The level of the various points on the response curve can be determined from the scope display, which is approximately linear, or more accurately, from the meter itself (with the sweep generator in manual sweep). Manual sweep can also be produced by varying the c-w frequency.

RF Output

1. Interconnect equipment as shown in Fig. 4.3 and set RANGE switch to LIN.

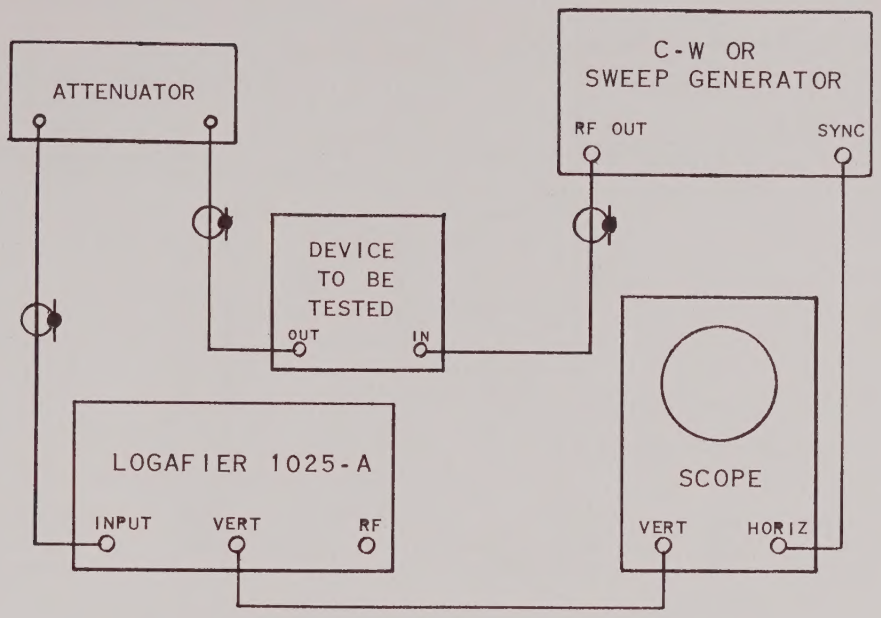


FIG. 4.2 - LINEAR AMPLIFICATION (DETECTED)

2. Set RF OUT-INT switch to RF OUT position. (Terminate RF OUT jack in a 50-ohm load.)

3. With r-f input set to 0.5 volt rms or less, adjust LIN GAIN control to desired output (0.3 volt rms or less). An output of 0.3 volt rms will provide a 0 db reading on the meter for a constant level c-w signal.

4.3 LOGARITHMIC AMPLIFICATION.

Detected Output

1. Interconnect equipment as in Fig. 4.2 and set RANGE switch to one of the three LOG ranges.

2. Set the RF OUT-INT switch to INT (switch may be set to RF OUT if the RF OUTPUT jack is terminated in 50 ohms).

3. If a c-w signal is applied (0.5 volt rms or less on the 80 db range, 0.158 volt rms or less on the 60 db range, 0.05 volt rms or less on the 40 db range), variations in signal level may be observed on the meter using the appropriate logarithmic scale.

4. The c-w frequency is tuned for the maximum output of the device under test, and the r-f level adjusted for a zero db reading on the meter. If the r-f level is not great enough for a zero db reading, a less sensitive LOG range may be used. If a zero db reading still cannot be obtained, note the difference between the lowest "db down" reading and zero db. Then, when an actual measurement is made, merely subtract this factor from the meter reading.

5. If a swept signal is to be used, see that its level does not exceed the limits of the normal operating range (4.1). If the signal overloads the unit, the response will be distorted.

6. The logarithmic response curve of the circuit under test may now be observed on the oscilloscope.

7. By switching in different levels of attenuation, you can calibrate the oscilloscope in db. Also, by using the Kay Electric KMC switch, you can have the different levels displayed continuously.

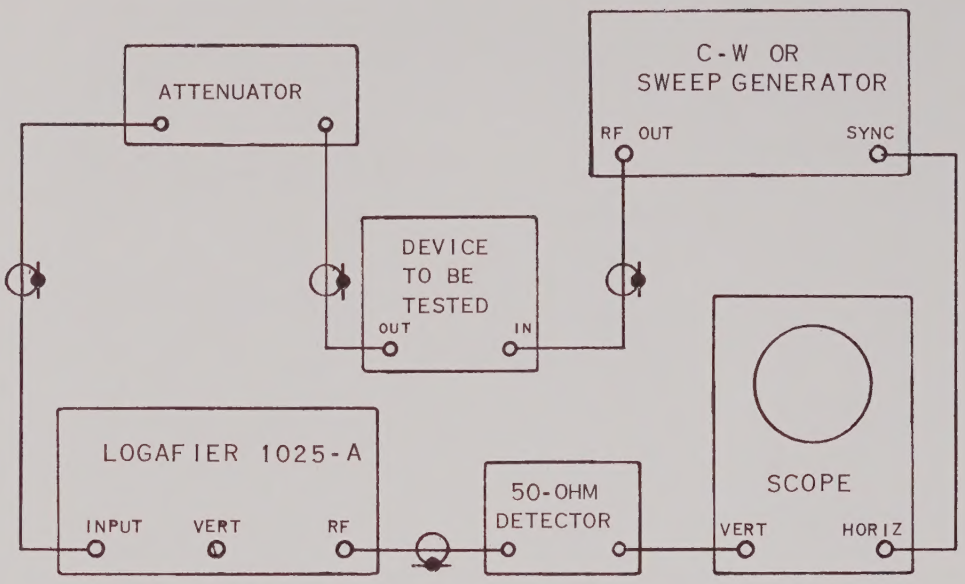


FIG. 4.3 - LINEAR AMPLIFICATION (RF OUTPUT)

8. The level of various points on the response curve can be determined from the scope trace, which is now approximately logarithmic (linear in db), or more accurately from the meter itself when the sweep generator is set at manual sweep. See Step 4 if a zero db reading cannot be obtained.

RF Output

1. Set the RF OUT-INT switch to RF OUT and terminate the jack in a 50 ohm load.

2. The "Detected Output" procedure of this section still applies, the only difference being that the RF OUT will now be logarithmic. An rms voltage of 0.3 is the maximum undistorted r-f output corresponding to the maximum scope deflection (4.1) and to a zero db reading on the meter (constant c-w input signal).

4.4 EXPANSION.

1. Interconnect the equipment as shown in Fig. 4.2.

2. Set up the 1025-A for detected output operation (4.3).

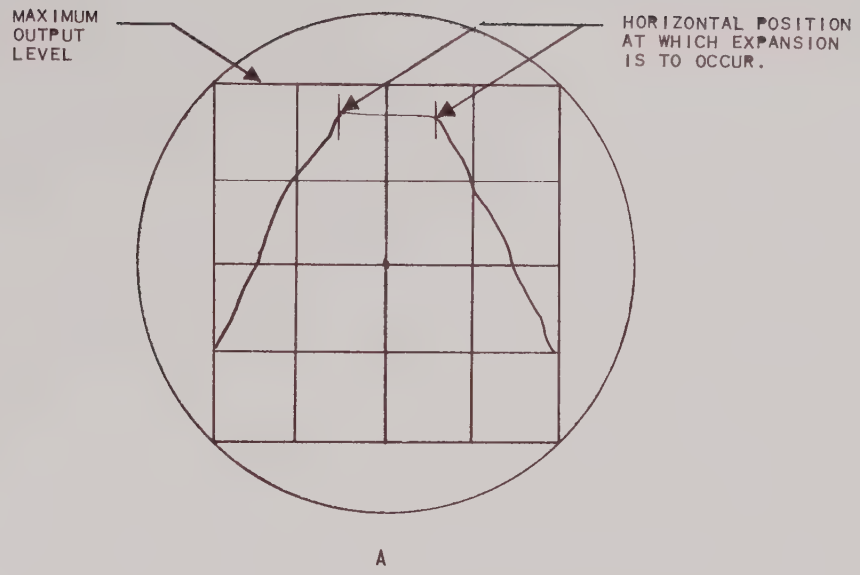
3. Use the LOG range which gives a zero or near zero reading on the meter (at the frequency corresponding to the peak output of the device under test) in c-w operation, as explained in Section 4.3, Step 4. Only if a zero db reading is obtained can a full 10 db of linear expansion be realized.

4. With the response curve now properly displayed on the scope, note the level of the point on the skirt above which the response curve is to be expanded (Fig. 4.4A). Record the vertical level in db at the expand threshold, if the skirt levels are to be measured during the expand operation.

5. Turn on the EXPAND switch.

6. Simultaneously, throw in attenuation at input and turn the EXPAND THRESHOLD control until the threshold is at the desired level, being sure there is enough attenuation in so that the maximum output level is not exceeded. (Fig. 4.4B).

7. The skirt level can be measured in db, if the expand threshold level is now measured. The change in threshold level, from the unexpanded reading, should be subtracted from the db reading of any point to be measured in the logarithmic portion of the response curve. This corrected reading should agree with readings taken before the EXPAND switch was thrown.



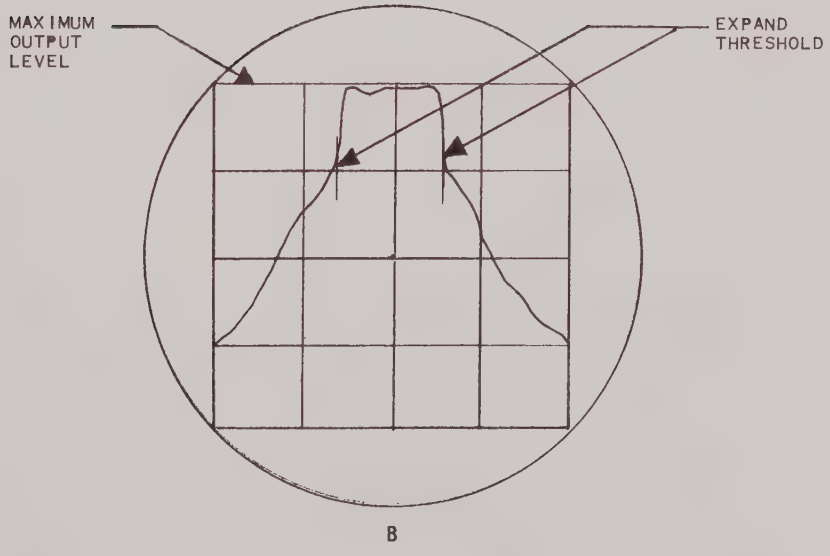


FIG. 4.4 - RESPONSE CURVE EMPLOYING EXPANSION FUNCTION.

SECTION V
CIRCUIT DESCRIPTION

5.1 OVERALL CIRCUITRY.

The r-f input is fed to a pentode amplifier (V-1) whose gain is controlled by the agc circuit. A four stage, common emitter amplifier follows the pentode and feeds a second agc-controlled pentode amplifier. The second pentode (V-2) is followed by a five-stage common emitter amplifier which is coupled to an emitter follower. Two outputs are taken from this emitter follower; one goes directly to the RF OUT jack and the other goes through the detector to the agc circuits, the VERT jack, and the meter circuits.

Logarithmic control is accomplished primarily by the two agc-controlled, remote cutoff pentode amplifiers. The bias of these tubes is controlled by the agc system so that the amplification of signals follows a logarithmic curve at the output of the second pentode amplifier (V-2).

The r-f output from the emitter follower is sampled and detected by a voltage-doubling diode detector circuit employing two high-frequency diodes. The output of this detector is a positive d-c voltage. A detector-correction circuit causes the detector output to be a linear function of its input. An emitter follower stage follows the detector, preventing the agc diodes from being overloaded by the vertical output, agc, and meter circuits. This stage also provides a low-impedance input to these circuits.

Three outputs are taken from the emitter follower, one providing a deflection voltage for the panel meter, the second providing the controlling voltage for the agc circuits, and the third providing the signal across the VERT jack.

An agc amplifier, used in a common emitter configuration, amplifies the agc voltage supplied by the emitter follower. The amplified voltage is passed through a compression circuit.

The compression circuits shape the agc voltage being fed to the grids of the pentode amplifiers. These amplifiers, when used with a linear agc amplifier, give an approximately logarithmic relationship between the r-f input signal and the r-f output signal being amplified. The compression circuits help these amplifiers produce a more accurate logarithmic amplification.

The expansion circuit allows a certain amount of the upper portion of the response curve to be amplified without logarithmic compression. The diode in this circuit acts as a clamp, holding the maximum value of the agc voltage at a level determined by the setting of the EXPAND THRESHOLD control which is part of a voltage divider network. The result of this action is that beyond the agc voltage determined by the setting of the EXPAND THRESHOLD control, the bias of the pentode amplifiers remains constant.

When the RANGE switch is set to the LIN position, the agc circuit is disconnected from the pentode amplifiers, and the bias is set by the LIN GAIN control.

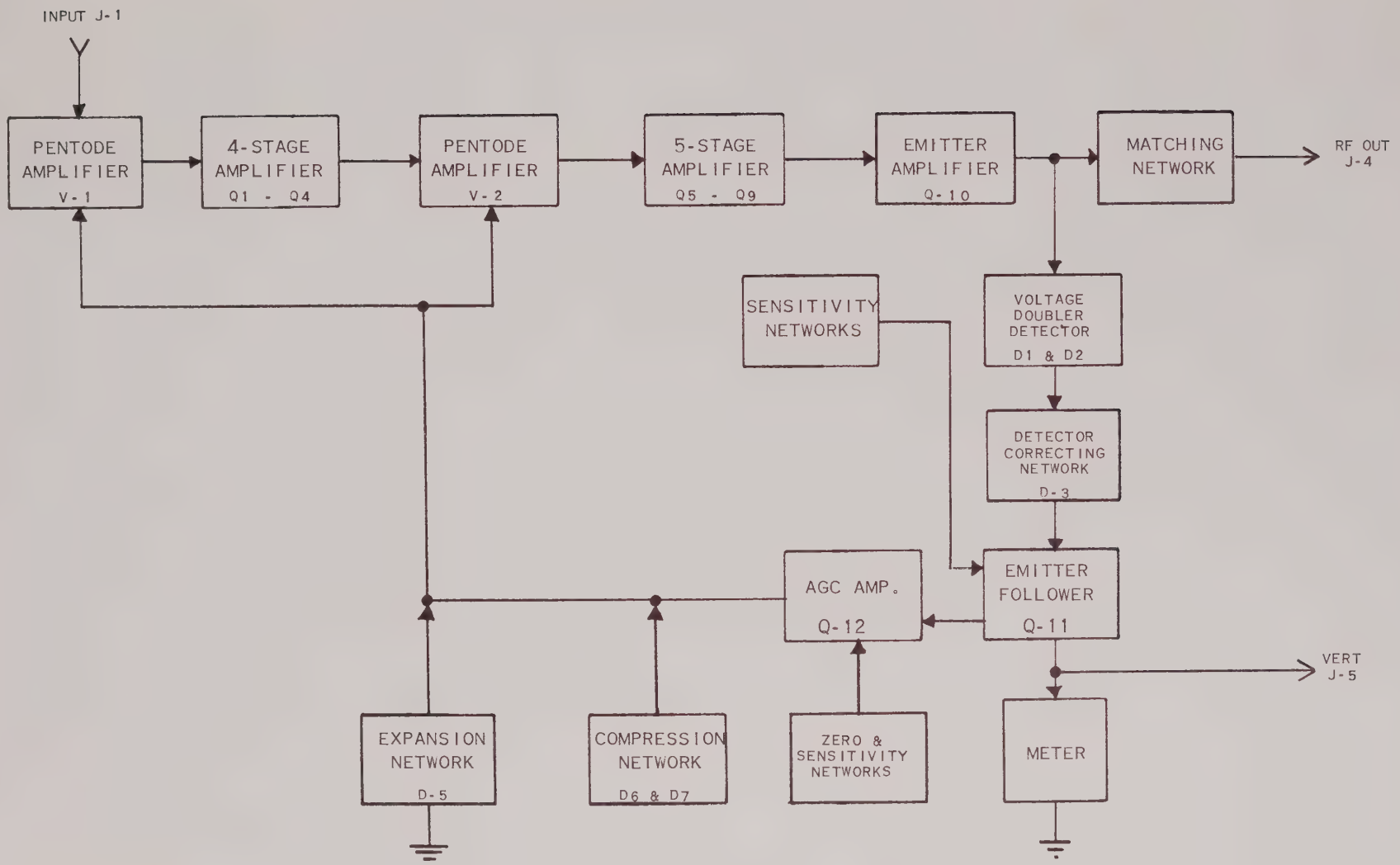


FIG. 5.1 - FUNCTIONAL BLOCK DIAGRAM, 1025-A.

SECTION VI
CALIBRATION INSTRUCTIONS

6.1 INTRODUCTION.

This section contains an alignment procedure which may be followed to perform a complete factory alignment of the Logafier 1025-A. If you have any problems meeting the specifications called for in the alignments, consult the trouble-shooting section for possible malfunctions. In order to maintain the accuracy of your adjustments, allow the unit 20 minutes warm-up time.

6.2 FUNCTION OF INTERNAL CONTROLS.

CONTROL	COMPONENT	FUNCTION
+6.3 volt Adj. -30 volt Adj.	R-143 R-140	Power supply voltage adjustments.
80 db Adj. 60 db Adj. 40 db Adj. COMP-1 COMP-2 COMP-3 COMP-4	R-126 R-127 R-128 R-107 R-116 R-117 R-119	Adjustments for proper tracking of the logarithmic curve.
80 db Zero 80 db Sens 60 db Zero 60 db Sens 40 db Zero 40 db Sens	R-105 R-112 R-104 R-99 R-103 R-101	Adjustments for calibration of the 1025-A at input signals of 0.5, 0.158 and 0.05 volt rms.

6.3 ALIGNMENT PROCEDURE.

Equipment Required:

Oscilloscope, DC to 300 kc response.

Differential Voltmeter.

Variable Autotransformer, 105 to 128 VAC.

Sweep Generator, 100 kc to 220 mc.

VTVM.

Step Attenuator (1-db steps), 0 to 60 db.

200 kc Absorption Filter.

Delay Line, 23 feet RG-58/U.

VSWR Standard, 1.3:1 (See text).

VSWR Detector, (See Fig. 6.1).

A. +6.3 volt Power Supply.

1. Locate a +6.3 volt test point on the schematic diagram and apply the differential voltmeter.

2. Using R-143, set the voltage to ±1% of +6.3.

   Note: Only adjust this power supply if you are prepared to perform a complete alignment of the 1025-A.

3. The regulation should be within 0.01 volt for a line voltage change of 105 to 128 volts.

4. The 120 cps A-C ripple in the +6.3 volt line should be less than 5 mv.

B. -30 volt Power Supply.

1. Using the differential voltmeter, adjust R-140 for ±2% of -30 volts output.

2. The regulation should be within 0.2 volt for a line voltage change of 105 to 128 volts.

3. The 120 cps A-C ripple should be less than 5 mv.

C. VSWR Adjustment.

1. Interconnect the equipment as shown in Fig. 6.2.

2. The VSWR standard consists of a 65-ohm, ¼ watt, precision resistor soldered to a coaxial connector. Keep the component leads short to maintain broadband characteristics.

3. The VSWR detector is shown in Fig. 6.1. Keep these leads short also.

4. Set the sweep generator for 220 mc sweep width, 110 mc center frequency, and 0.05 volt rms output.

5. Adjust the vertical gain of the scope for about 6 cm of deflection, and note the amplitude of the reflected wave.

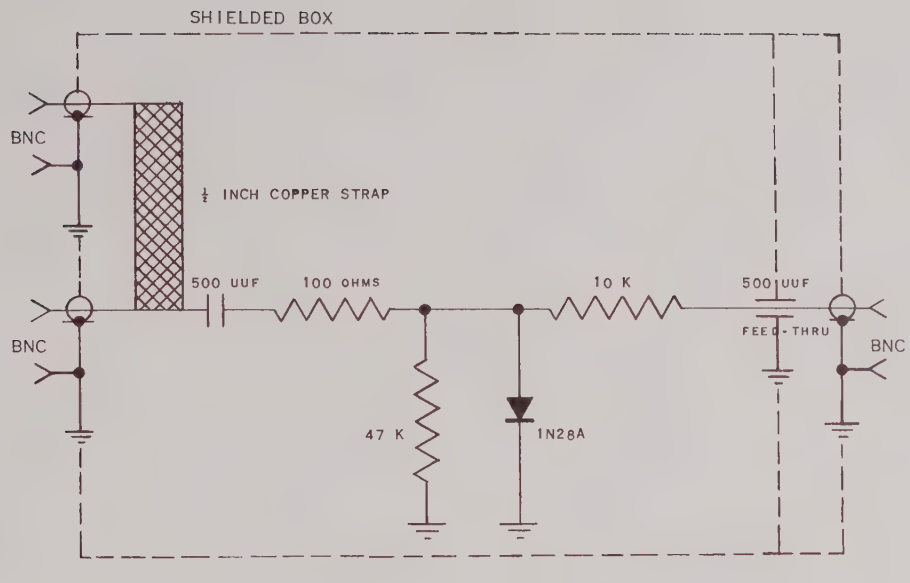


FIG. 6.1 - VSWR DETECTOR

6. Disconnect the VSWR standard and connect the output of the delay line to the input of the 1025-A. The 1025-A POWER switch should be on.

7. Adjust the input trimmer (C-1) for minimum VSWR in the bandpass of the 1025-A. If it is not less than the value obtained with the standard, adjust the coil spacing of L-1 and readjust C-1.

8. This procedure can be simplified if a commercial VSWR measuring instrument available (accurate to 220 mc).

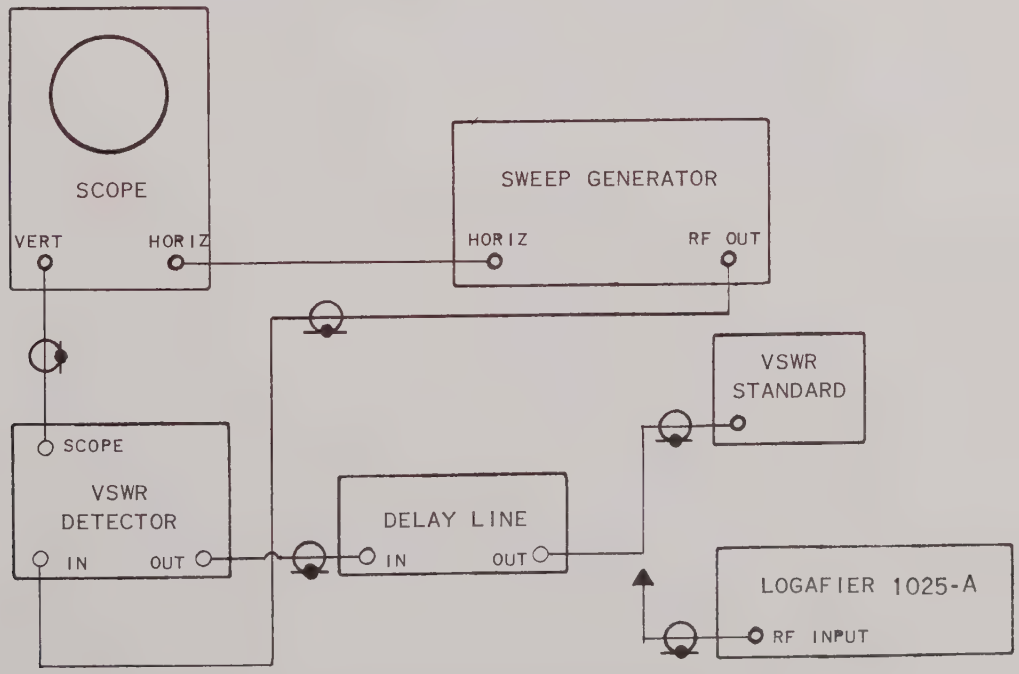


FIG. 6.2 - VSWR ADJUSTMENT

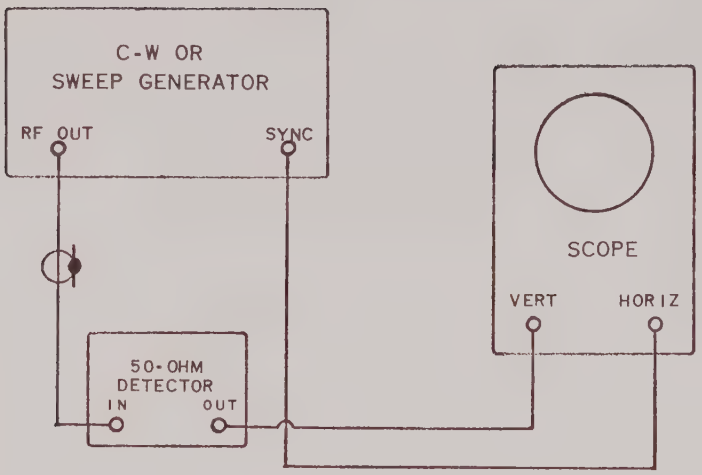


FIG. 6.3 - REFERENCE LEVEL CHECK

D. Amplifier Alignment.

1. Interconnect the equipment as shown in Fig. 6.3.

2. Set the r-f output of the generator to 0.3 volt rms, and note the detected output level on the scope screen. This establishes the reference of 0.3 volt rms as long as the gain of the scope is not changed.

3. Now interconnect the equipment as shown in Fig. 6.4. Set the RANGE switch on the 1025-A to LIN, and attenuate the generator by 57 db.

4. Connect a VTVM between the grid of V-1 (pin 2, 6EH7) and ground. Adjust the LIN GAIN control for a reading of -2.1 volts.

5. If necessary, select values for the negative feedback resistors R-52 and R-71 for an output level of 0.3 volt rms, and a gain of 57 db (± 1 db).

6. It may be necessary to adjust C-82, C-83, and C-84 to obtain a flat response in the 20 to 175 mc area.

7. Adjustments may be made on L-3, L-4, and L-5 to obtain flatness in the 150 to 220 mc region. (A gradual slope from 150 mc to 1 db down at 220 mc should give best operation at all gain levels.)

8. Check flatness at gains of 57 db, 40 db, 20 db, and 0 db. The flatness should stay within these limits:

±1 db - 200 kc to 220 mc
±0.5 db - 500 kc to 110 mc

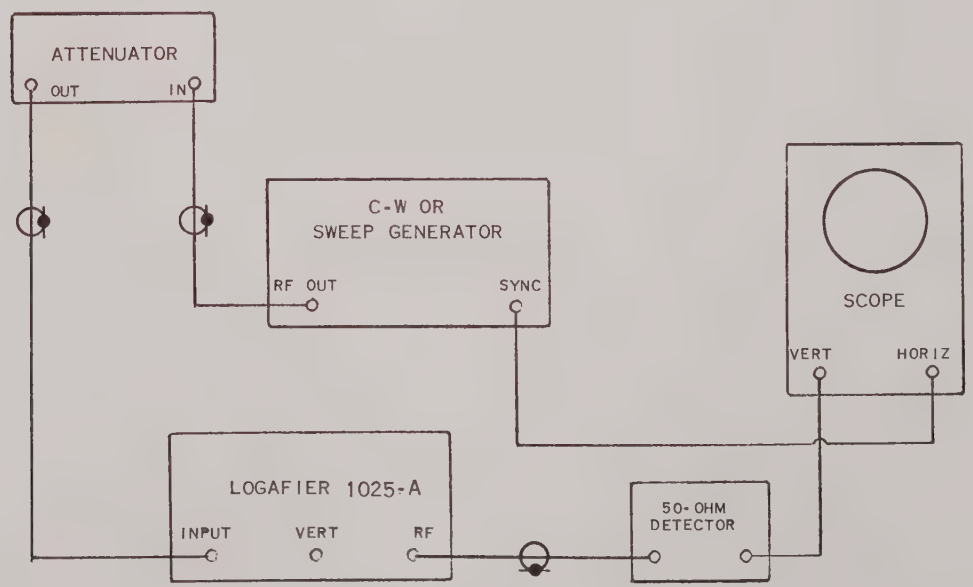


FIG. 6.4 - AMPLIFIER GAIN CHECK

E. Linear Range Adjustment.

1. Set 0.3 volt rms reference on the scope screen.

2. Interconnect the equipment as shown in Fig. 6.4. Set the generator output level to 0.5 volt rms, 30 mc, CW, and attenuate the output 20 db.

3. Set LIN GAIN control for 0.3 volt rms output on the scope screen (reference level).

4. Adjust the ZERO control (R-97) for a 0 db reading on the panel meter.

5. Attenuate the 1025-A input by an additional 5 db and note the meter deflection. If there is any error, adjust the SENS control (R-92) so that the error is twice as great.

6. Remove the 5 db attenuation, and readjust the ZERO control.

7. It may be necessary to repeat the preceding steps a few times to obtain perfect tracking at 5 db.

8. Check the meter tracking in 1-db steps up to 20 db. Tracking error should be less than 5% of the reading or 0.3 db, whichever is greater.

F. Logarithmic Range Adjustment.

Preliminary

1. Interconnect the equipment as shown in Fig. 6.4. Set the generator for 30 mc, CW, 0.5 volt rms output.

2. Set the oscilloscope for internal sweep, 5 ms/cm and vertical gain for approximately 0.1 v/cm. The scope screen pattern should be observed closely throughout this test to see that there is no oscillation or noise present due to agc malfunctions.

80-db Range

1. Set the RANGE switch to 80 db, and adjust the 80-db zero control (R-105) for a 0-db reading on the panel meter.

2. Attenuate the input by 15 db and adjust the 80-db sensitivity control (R-112) for a reading of 15 db on the meter.

3. Remove the 15 db attenuation and repeat the two preceding steps until the meter tracks at 15 db.

4. Attenuate the input 25 db and adjust COMP-1 control (R-107) for a 25-db reading on the meter.

5. Attenuate the input 30 db and adjust COMP-2 control (R-116) for a 30-db reading on the meter.

6. Repeat the two preceding steps until the meter tracks at the 25 and 30-db points.

7. If the meter does not track at 20 db, adjust the COMP-1 and COMP-2 controls for 20 and 25 db, respectively.

8. Attenuate the input 35 db and adjust COMP-4 control (R-119) for a 35-db reading on the meter.

9. Attenuate the input 40 db and adjust the COMP-3 control for a 40-db reading on the meter.

10. Repeat the two preceding steps until the meter tracks at 35 and 40 db.

11. If the 50 and 60-db points are not within ±1 db, readjust the COMP-3 control.

12. Attenuate the input 80 db, and adjust the 80-db Adj control (R-126) for a reading of 80 db on the meter.

13. If the 70-db reading does not meet specifications, readjust the 80-db Adj control to divide the error between the 70 and 80-db readings.

14. Check tracking of the 80-db range in 5-db steps. The meter should track within ±1 db in the 0 to 65 db range, and ±2 db in the 65 to 80 db range.

60 db Range

1. Set generator for 0.158 volt rms output (10 db down from 0.5 volt level). Set 1025-A RANGE switch to 60 db.

2. Adjust 60 db zero control (R-104) for a zero db reading on the panel meter.

3. Attenuate 1025-A input 30 db and adjust the 60 db sensitivity control (R-99) for twice the error in the meter reading.

4. Remove 30 db attenuation and adjust the 60 db zero control for a zero reading on the meter.

5. Repeat the two preceding steps until the meter tracks at 30 db.

6. Attenuate input 60 db and adjust 60 db Adj. control (R-127) for a reading of 60 db.

7. If 55 db reading does not meet specifications, readjust the 60 db Adj. control to divide the error between the 55 and 60 db readings.

8. Check tracking of the 60 db range down to 60 db level in 5 db steps. Meter should be within ±1 db in the 0 to 50 db range, and ±2 db in the 50 to 60 db range.

40 db Range

1. Set generator output for 0.05 volt rms (20 db down from 0.5 volt rms level), and set RANGE switch to 40 db.

2. Adjust 40 db zero control (R-103) for a zero db reading on the panel meter.

3. Attenuate input 20 db and adjust the 40 db sensitivity control (R-101) to double the error in the meter reading.

4. Remove 20 db attenuation, and adjust the 40 db zero control for a zero db reading.

5. Repeat the two preceding steps until the meter tracks at 20 db.

6. Attenuate input by 40 db and adjust the 40 db Adj. control (R-128) for a reading of 40 db on the panel meter.

7. If the 35 db reading does not meet specifications, readjust the 40 db Adj. control to divide the error between the 35 and 40 db readings.

8. Check tracking of 40 db range down to 40 db in 5 db steps. Meter should track within ±1 db in the zero to 30 db range and ±2 db in the 30 to 40 db range.

SECTION VII
MAINTENANCE

7.1 VISUAL INSPECTION.

The Logafier 1025-A should be visually inspected regularly, usually during periodic maintenance checks, for such things as loose or broken connections, or cracked terminal strips. Signs of overheating such as scorched wires or resistors, discolored casings, or melted wax may indicate other, less-apparent troubles.

7.2 PARTS REPLACEMENT.

All components of the 1025-A are easily accessible and require no special replacement procedures. However, since some of the solid-state components used may be damaged when subjected to intense heat, avoid overheating when soldering the leads of those components. Longnose pliers may be used as a heat sink between the component and the tip of the soldering iron. The soldering iron should be hot before touching the solder joint, and removed immediately after the solder flows.

The circuits which make up the r-f amplifier (Q-1 through Q-10 and V-1 and V-2) are highly critical. All parts removed from these sections should be replaced in their original positions and the transistor lead lengths should remain the same.

After a part has been replaced, its circuit should be checked in accordance with Section III to determine that the 1025-A has maintained its original operating characteristics. If the minimum standards are not obtained, the applicable alignment procedure should be performed.

7.3 TROUBLESHOOTING DATA.

This section contains information, voltage charts, and call-out photographs for use in servicing the Logafier 1025-A. To minimize unnecessary labor, try to use the Alignment Procedure before making any repairs. Certain abnormalities can be compensated for, using the proper adjustments.

To maintain the reliability of this instrument, always realign any portion that has been repaired. If the power supply has been serviced, it is wise to perform the Check-Out Procedure. If this check reveals that functions are not within specifications, follow the appropriate portion of the Alignment Procedure.

Insufficient Gain in Linear and Logarithmic Range

Check the power supply; the transistor voltages are given below. These voltages are only approximate and will vary according to the line voltage and the settings of the power supply potentiometers.

TRANSISTOR	EMITTER	BASE	COLLECTOR
Q-15	-30	-31	-40
Q-16	-31	-31	-40
Q-17	0	-0.1	-31
Q-18	+3	+2.8	-0.8
Q-19	-0.7	-0.8	-7
Q-20	-0.5	-0.7	-7

If the power supply is not at fault, measure the voltages of the r-f amplifier section. The pertinent d-c levels are given below.

TRANSISTOR	COLLECTOR VOLTAGE
Q-1	-15
Q-2	-15
Q-3	-18
Q-4	-20
Q-5	-15
Q-6	-15
Q-7	-15
Q-8	-18
Q-9	-20
Q-10	-19 (emitter voltage)

No Vert Output

Check the detector diodes D-1 and D-2. If these are good, test Q-11; these voltages were measured at an r-f output of 0.3 volt rms.

EMITTER +1.3; BASE +1.5; COLLECTOR +6.3

Insufficient Expansion (less than 10 db)

Check diode D-5 and resistors R-113, R-114, and R-115.

RF Output not Flat

Check the transistors in the r-f amplifier section. Refer to the previous chart for the d-c levels.

7.4 RESHIPMENT INSTRUCTIONS.

Permission to return equipment should, in every case, be obtained from the factory or an accredited Kay representative before return shipment is made.

If it becomes necessary to return the 1025-A to the factory for repair, it should be securely padded to cushion the instrument during transit. A packing slip should be included in the carton furnishing identification of the shipper. The packing slip should also reference the instrument type and serial number. A statement indicating the malfunction should be included for the benefit of the service personnel.

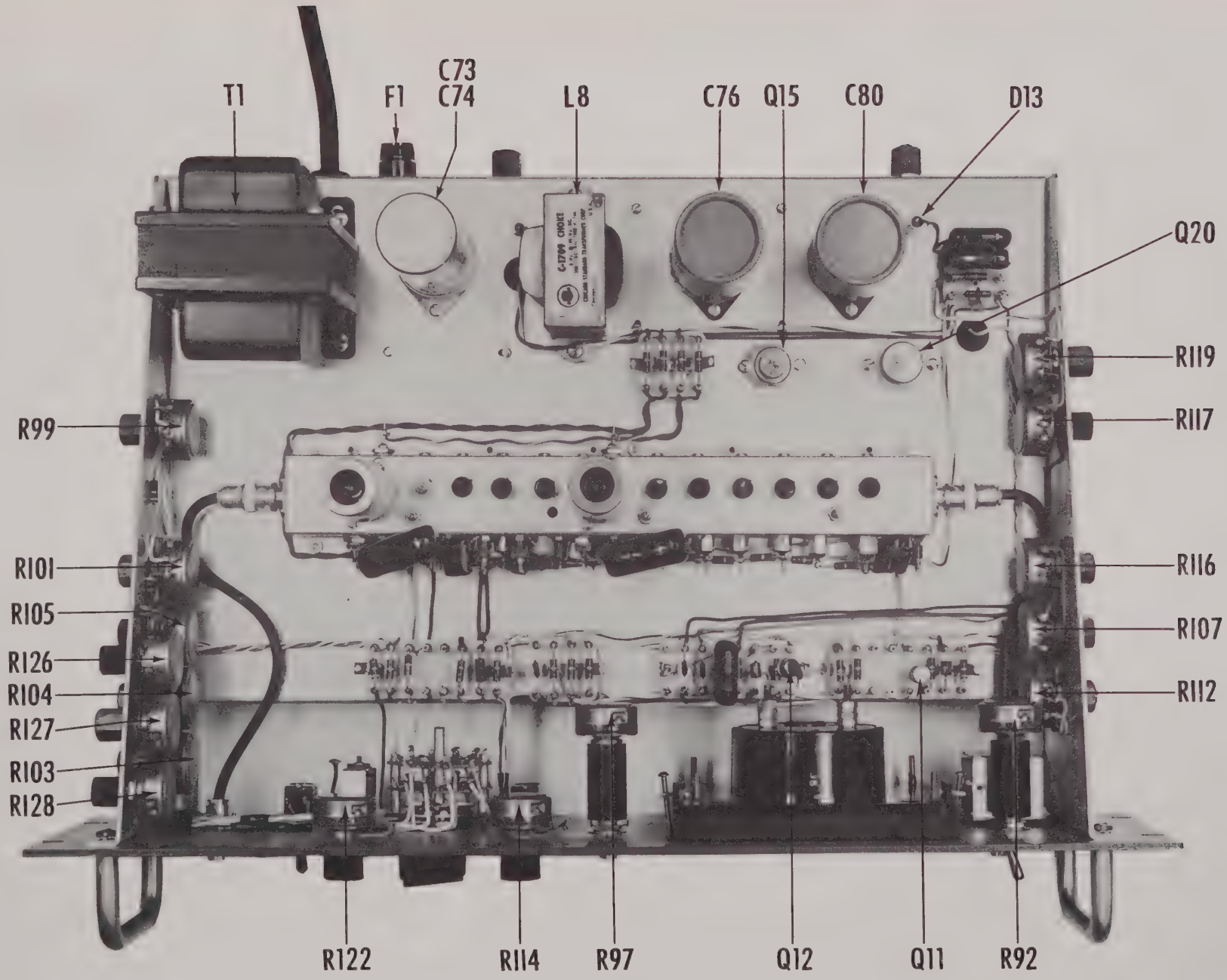
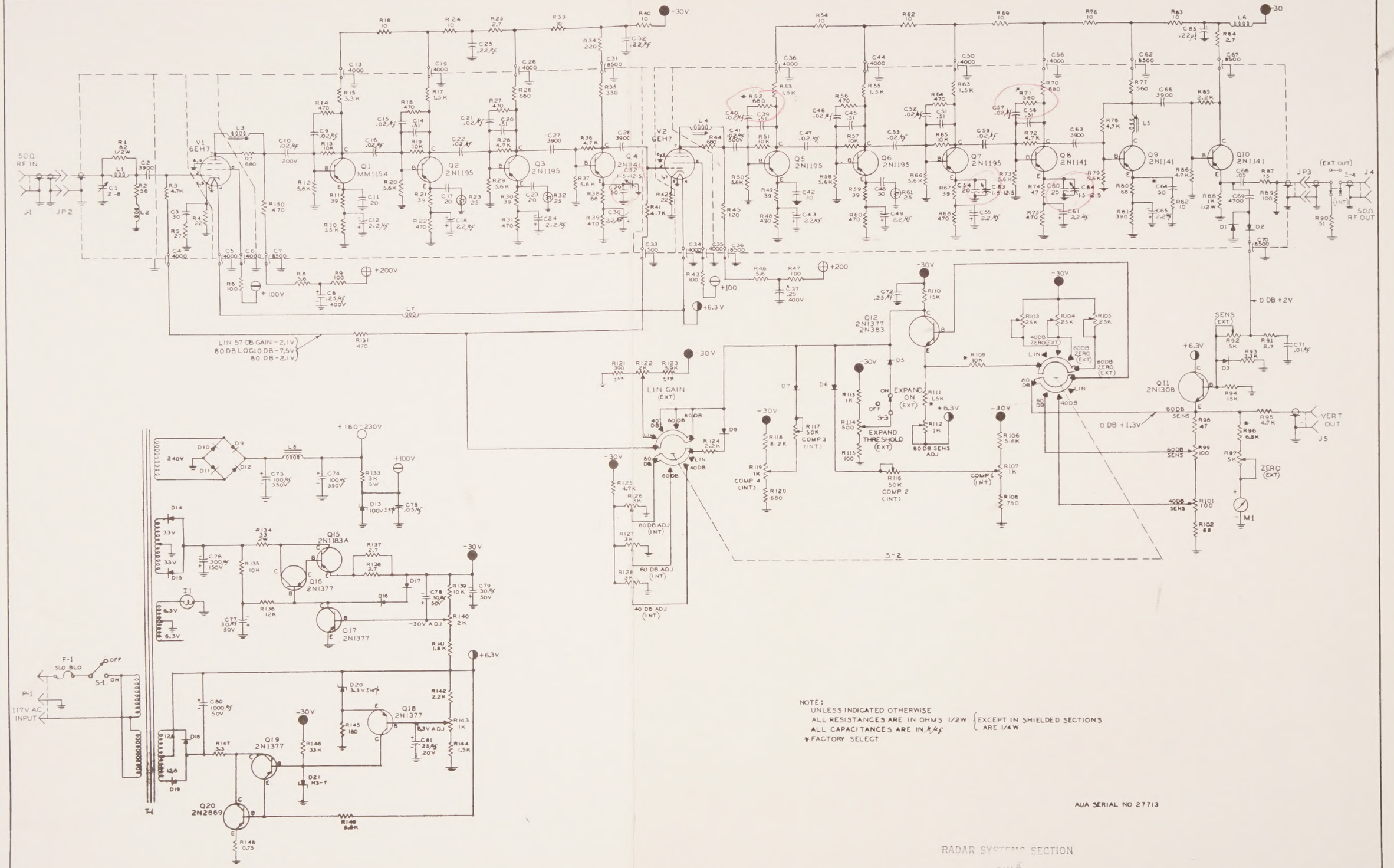


FIG. 7.1 - TOP VIEW, LOGAFIER 1025-A



NOTE:
UNLESS INDICATED OTHERWISE
ALL RESISTANCES ARE IN OHMS 1/2W {EXCEPT IN SHIELDED SECTIONS ARE 1/4W
ALL CAPACITANCES ARE IN μf
*FACTORY SELECT

AUA SERIAL NO 27713

RADAR SYSTEMS SECTION

FIG. 7.3 - LOGAFIER 1025-A SCHEMATIC, D-8033-E

7.5 PARTS LIST.

Please reference instrument type, serial number, and Kay Part number when ordering components.

DWG. SYMBOL NO.	DESCRIPTION	KAY PART NO.
	Capacitors: (All capacitances in uuf, 500 volts, unless otherwise indicated.)	
C1	2-8, ceramic trimmer	6358-12
C2	3900, 200V, ceramic disc	6360-28
C3	30, silver mica	6359-58
C4 thru C6	4000, ceramic feed thru	6356-5
C7	8500, ceramic feed thru	6356-7
C8	0.25uf, 400V, Mylar-paper	6899-3
C9	0.02uf, 75V, ceramic disc	6360-23
C10	0.02uf, ceramic disc	6360-7
C11	20, silver mica	6359-57
C12	2.2uf, 20V, electrolytic	6355-74
C13	4000, ceramic feed thru	6356-5
C14	0.51, ceramic tubular	6361-33
C15 & C16	0.02uf, 75V, ceramic disc	6360-23
C17	20, silver mica	6359-57
C18	2.2uf, 20V, electrolytic	6355-74
C19	4000, ceramic feed thru	6356-5
C20	0.51, ceramic tubular	6361-33
C21 & C22	0.02uf, 75V, ceramic disc	6360-23
C23	20, silver mica	6359-57
C24	2.2uf, 20V, electrolytic	6355-74
C25	0.22uf, 50V, Mylar	6411-1
C26	4000, ceramic feed thru	6356-5
C27 & C28	3900, 200V, ceramic disc	6360-28
C29	50, silver mica	6359-60
C30	2.2uf, 20V, electrolytic	6355-74
C31	8500, ceramic feed thru	6356-7
C32	0.22uf, 50V, Mylar	6411-1
C33	500, ceramic feed thru	6356-6
C34 & C35	4000, ceramic feed thru	6356-5
C36	8500, ceramic feed thru	6356-7
C37	0.25uf, 400V, Mylar-paper	6899-3
C38	4000, ceramic feed thru	6356-5
C39	0.51, ceramic tubular	6361-33
C40	0.02uf, 75V, ceramic disc	6360-23
C41	0.02uf, ceramic disc	6360-7
C42	30, silver mica	6359-58
C43	2.2uf, 20V, electrolytic	6355-74
C44	4000, ceramic feed thru	6356-5
C45	0.51, ceramic tubular	6361-33
C46 & C47	0.02uf, 75V, ceramic disc	6360-23
C48	30, silver mica	6359-58
C49	2.2uf, 20V, electrolytic	6355-74
C50	4000, ceramic feed thru	6356-5
C51	0.51, ceramic tubular	6361-33
C52 & C53	0.02uf, 75V, ceramic disc	6360-23
C54	20, silver mica	6359-57
C55	2.2uf, 20V, electrolytic	6355-74
C56	4000, ceramic feed thru	6356-5
C57	0.02uf, 75V, ceramic disc	6360-23
C58	0.51, ceramic tubular	6361-33
C59	0.02uf, 75V, ceramic disc	6360-23
C60	25, silver mica	6359-78
C61	2.2uf, 20V, electrolytic	6355-74
C62	8500, ceramic feed thru	6356-7
C63	3900, 200V, ceramic disc	6360-28
C64	Factory selected	
C65	2.2uf, 20V, electrolytic	6355-74
C66	3900, 200V, ceramic disc	6360-28
C67	8500, ceramic feed thru	6356-7
C68	0.05uf, 75V, ceramic disc	6360-16
C69	4700, ceramic disc	6360-29
C70	8500, ceramic feed thru	6356-7
C71	0.01uf, 100V, Mylar-paper	6899-12
C72	0.25uf, 100V, Mylar-paper	6899-20
C73 & C74	100/100uf, 350V, electrolytic	6355-76
C75	0.05uf, 100V, Mylar-paper	6899-1
C76	300uf, 150V, electrolytic	6355-67
C77 thru C79	30uf, 50V, electrolytic	6355-77
C80	1000uf, 50V, electrolytic	6355-79
C81	25uf, 25V, electrolytic	6355-78
C82 thru C84	1.5 - 12.5uuf, ceramic trimmer	6358-13
C85	0.22uf, 50V, Mylar	6411-1
	Diodes:	
D1 & D2	Silicon D3530	6357-51
D3	Silicon F6	6357-3
D4	Not used	
D5	Silicon F6	6357-3
D6 thru D8	Silicon 1N461	6357-57
D9 thru D12	Silicon F6	6357-3
D13	Zener 1N3005B	6357-58
D14 & D15	Silicon F6	6357-3
D16 & D17	Silicon 1N461	6357-57
D18 & D19	Silicon F6	6357-3
D20 Zener	Zener ¼M3.3AZ10	6357-59
D21	Zener HS-7	6357-60
F1	Fuse, 1 amp, slow blow	466
I1	Lamp, Bayonet #44	249
J1	Connector, female, UG-291A/U	8609
J2 & J3	Connector, female, UG-185/U	204
J4 & J5	Connector, female, UG-290/U	8608
	Coils:	
L1	Special, wound on R1	L1/8033E
L2	Special, wound on R2	L2/8033E
L3	Special, slug-tuned	L3/8033E
L4	Special, slug-tuned	L4/8033E
L5	Special, slug-tuned	L5/8033E
L6	Choke, 15uh	6394-5
L7	Choke, 12uh	6394-1
L8	Choke, 8 hy	4723
M1	Meter, DB	7678
P1	Plug, AC line cord	7166
P2 & P3	Plug, UG-88/U	213
	Transistors:	
Q1	MM1154	K-137
Q2	2N1195	K128-3
Q3	2N1195	K128-5
Q4	2N1141	K127-5
Q5	2N1195	K128-5
Q6 & Q7	2N1195	K128-4
Q8 thru Q10	2N1141	K127-5
Q11	2N1308	K133
Q12	2N1377	K134
Q13 & Q14	Not used	
Q15	2N1183A	K135
Q16 thru Q19	2N1377	K134
Q20	2N2869	K136

DWG. SYMBOL NO.	DESCRIPTION	KAY PART NO.
	Resistors: (Unless otherwise specified, all resistors are fixed composition, ½ watt, 10% tolerance.)	
R1	82, with coil (L1)	
R2	56, ¼W, with coil (L2)	
R3	4.7K, ¼W	4721-C
R4	22, ¼W	2201-C
R5	27, ¼W	2701-C
R6	100	1011-E
R7	680, ¼W	6811-C
R8	5.6	5P61-E
R9	100	1011-E
R10	1.5K, ¼W	1521-C
R11	39, ¼W	3901-C
R12	5.6K, ¼W	5621-C
R13	10K, ¼W	1031-C
R14	470, ¼W	4711-C
R15	3.3K, ¼W	3321-C
R16	10	1001-E
R17	1.5K, ¼W	1521-C
R18	470, ¼W	4711-C
R19	10K, ¼W	1031-C
R20	5.6K, ¼W	5621-C
R21	39, ¼W	3901-C
R22	470, ¼W	4711-C
R23	25, Thermistor (LB13J1)	8610
R24	10	1001-E
R25	2.7, 5% tolerance	2R75-E
R26	680, ¼W	6811-C
R27	470, ¼W	4711-C
R28	4.7K, ¼W	4721-C
R29	5.6K, ¼W	5621-C
R30	39, ¼W	3901-C
R31	470, ¼W	4711-C
R32	25, Thermistor (LB13J1)	8610
R33	10	1001-E
R34	220	2211-E
R35	330, ¼W	3311-C
R36	4.7K	4721-C
R37	5.6K, ¼W	5621-C
R38	68, ¼W	6801-C
R39	470, ¼W	4711-C
R40	10	1001-E
R41	4.7K ¼W	4721-C
R42	22, ¼W	2201-C
R43	100	1011-E
R44	680, ¼W	6811-C
R45	120, ¼W	1211-C
R46	5.6	5P61-E
R47	100	1011-E
R48	470, ¼W	4711-C
R49	39, ¼W	3901-C
R50	5.6K, ¼W	5621-C
R51	10K, ¼W	1031-C
R52	Factory selected	
R53	1.5K, ¼W	1521-C
R54	10	1001-E
R55	1.5K, ¼W	1521-C
R56	470, ¼W	4711-C
R57	10K, ¼W	1031-C
R58	5.6K, ¼W	5621-C
R59	39, ¼W	3901-C
R60	470, ¼W	4711-C
R61	25, Thermistor (LB13J1)	8610
R62	10	1001-E
R63	1.5K, ¼W	1521-C
R64	470, ¼W	4711-C
R65	10K, ¼W	1031-C
R66	5.6K, ¼W	5621-C
R67	39, ¼W	3901-C
R68	470, ¼W	4711-C
R69	10	1001-E
R70	680, ¼W	6811-C
R71	Factory selected	
R72	4.7K, ¼W	4721-C
R73	5.6K, ¼W	5621-C
R74	47, ¼W	4701-C
R75	470, ¼W	4711-C
R76	10	1001-E
R77	560, ¼W	5611-C
R78	4.7K, ¼W	4721-C
R79	5.6K, ¼W	5621-C
R80	68, ¼W	6801-C
R81	390, ¼W	3911-C
R82	10, ¼W	1001-C
R83	10	1001-E
R84	2.7, 5% tolerance	2P75-E
R85	2.2K, ¼W	2221-C
R86	4.7K, ¼W	4721-C
R87	75, ¼W, 5% tolerance	7505-C
R88	1K	1021-E
R89	100, ¼W	1011-C
R90	51, 5% tolerance	5105-E
R91	2.7, 5% tolerance	2P75-E
R92	5K, 2W pot, variable	142
R93	3.3K	3321-E
R94	15K	1531-E
R95	4.7K	4721-E
R96	Factory selected	
R97	5K, 2W pot, variable	142
R98	47	4701-E
R99	100, 2W pot, variable	90
R100	Not used	
R101	100, 2W pot, variable	90
R102	68	6801-E
R103 thru R105	25K, 2W pot, variable	113
R106	5.6K	5621-E
R107	1K, 2W pot, variable	139
R108	750, 5% tolerance	7515-E
R109	Factory selected	
R110	15K	1531-E
R111	Factory selected	
R112	1K, 2W pot, variable	139
R113	1K	1021-E
R114	500, 2W pot, variable	100
R115	100	1011-E
R116 & R117	50K, 2W pot, variable	117
R118	8.2K	8221-E
R119	1K, 2W pot, variable	139
R120	680	6811-E
R121	390	3911-E
R122	2K, 2W pot, variable	105
R123	3.9K	3921-E
R124	2.2K	2221-E
R125	4.7K	4721-E
R126 thru R128	3K, 2W pot, variable	107
R129 & R130	Not used	
R131	470	4711-E
R132	Not used	
R133	3K, 5W, wire wound	3021-J
R134	33, 2W	3301-H
R135	10K	1031-E
R136	12K	1231-E
R137 & R138	2.7	2P75-E
R139	10K	1031-E
R140	2K, 2W pot, variable	105
R141	1.8K	1821-E
R142	2.2K	2221-E
R143	1K, 2W pot, variable	139
R144	1.5K	1521-E
R145	180	1811-E
R146	33K	3331-E
R147	3.3, 1W	3P31-G
R148	0.75, 1W	P755-G
R149	5.6K	5621-E
R150	470	4711-E

KAY

Multi-Sweep

159-B

1 MC TO 300 MC
WIDE-SWEEP AND
MARKER GENERATOR

SPECIFICATIONS

Frequency Range: Continuously variable 1 mc to 300 mc.

Sweep Width: Continuously variable 200 kc to 300 mc., CW mode.

Sweep Rate: Variable from 5 to 50 cps, locks to line, manual mode.

RF Output: 0.5 volt rms into 50 ohms (70 on request); flat to within ± 0.25 db over widest sweep. METERED.

Markers: Provision for birdie pip marker from external oscillator. Up to 8 fixed crystal controlled markers at customer specified frequencies. Separate level control and output, isolated from rf circuits.

Harmonic distortion: More than 30 db down
Spurious: More than 30 db down

Attenuators: Switched 20, 20, 20, 10, 6, 3 db plus variable 6 db.

Sweep Output: Sawtooth, synchronized with swept output

Power Supply: Approx. 20 watts, 117 volts (± 10%), 50-60 cps ac

Dimensions: 8 x 19½ x 13½

Weight: 28 lbs.

KAY

Attenuators

MODEL

30-0, 31-0, and 32-0

432-C, 442-C, and 452-C

- **Zero-db fixed insertion loss.**
- **Zero up to 101 db attenuation in 1-db steps.**
- **Choice of 50, 70, or 90-ohm impedance.**

SPECIFICATIONS

Input and Output Impedance: 50 ohms nom. for Model 30-0; 70 ohms nom. for Model 31-0; 90 ohms nom. for Model 32-0.

DB Switched: 101 db in 9 steps.

Steps: 20 db, 20 db, 20 db, 20 db, 10 db, 5 db, 3 db, 2 db, 1 db.

Insertion Loss: Zero db at low frequencies; approx. 0.1 db at 250 mc; approx. 0.2 db at 500 mc.

Max. Total Error (Including Insertion Loss): 1.0 db at 250 mc and 2.0 db from 250 to 500 mc at full attenuation; better accuracy at lower frequencies.

Frequency Range: DC to 500 mc; useful to 1000 mc.

SWR: 1.2:1 max. up to 250 mc, 1.4:1 max., 250 to 500 mc (50 and 70 ohms nom.); 1.3:1 max. up to 250 mc, 1.5:1 max. from 250 to 500 mc (90 ohms nom.).

Switches: Rugged High Frequency Type, solid silver contacts set in teflon body.

Connectors: BNC type UG-185/U.

Dimensions: 2" x 9¾" x 2". **Net Weight:** 3 lbs.